**LITERATURE SURVEY**

## 1) Human decomposition and the reliability of a 'Universal' model for post mortem interval estimation.

**AUTHORS: Diane L Cockle, Lynne S Bell.**

Human decomposition is a complex biological process driven by an array of variables which are not clearly understood. The medico-legal community have long been searching for a reliable method to establish the post-mortem interval (PMI) for those whose deaths have either been hidden, or gone un-noticed. To date, attempts to develop a PMI estimation method based on the state of the body either at the scene or at autopsy have been unsuccessful. One recent study has proposed that two simple formulae, based on the level of decomposition humidity and temperature, could be used to accurately calculate the PMI for bodies outside, on or under the surface worldwide. This study attempted to validate 'Formula I' [1] (for bodies on the surface) using 42 Canadian cases with known PMIs. The results indicated that bodies exposed to warm temperatures consistently overestimated the known PMI by a large and inconsistent margin for Formula I estimations. And for bodies exposed to cold and freezing temperatures (less than 4°C), then the PMI was dramatically under estimated. The ability of 'Formulae II' to estimate the PMI for buried bodies was also examined using a set of 22 known Canadian burial cases. As these cases used in this study are retrospective, some of the data needed for Formula II was not available. The 4.6 value used in Formula II to represent the standard ratio of time that burial decelerates the rate of decomposition was examined. The average time taken to achieve each stage of decomposition both on, and under the surface was compared for the 118 known cases. It was found that the rate of decomposition was not consistent throughout all stages of decomposition. The rates of autolysis above and below the ground were equivalent with the buried cases staying in a state of putrefaction for a prolonged period of time. It is suggested that differences in temperature extremes and humidity levels between geographic regions may make it impractical to apply formulas developed in one region to any other region. These results also suggest that there are other variables, apart from temperature and humidity that may impact the rate of human decomposition. These variables, or complex of variables, are considered regionally specific. Neither of the Universal Formulae performed well, and our results do not support the proposition of Universality for PMI estimation..

# 2) Time Since Death: A Review of the Current Status of Methods used in the Later Postmortem Interval

**AUTHORS:M.J. Buchan , Gail Anderson.**

This paper reviews alterations to the human body that occur after death, and the numerous factors that serve to alter the rate and nature of decomposition. Forensic dating methods, with a focus on forensic anthropological techniques, currently in use and those that have only recently been introduced are outlined, with the strengths and weaknesses of each technique reviewed critically. Finally, recommendations for future research are proposed which highlight the problems that plague current research, serving to render much of the work currently being published as potentially inapplicable to forensic scientists concerned with time since the death layered network has been constructed. The models under study are different in the number of hidden neurons.

# 3) Nature, Forensics, and the Struggle to Pinpoint Time of Death

**AUTHORS** **:*Jessica Snyder Sachs.***

# In 1932, Arthur Koehler helped catch a notorious suspect wanted for the Lindbergh baby murder by tracing a wooden ladder from a sawmill to a lumberyard and finally to the killer—thereby giving rise to forensic botany. By elucidating such rare moments in history, Sachs, a freelance writer whose work has appeared in *Discover*, *Parenting* and *Redbook*, examines the often distasteful world of the forensic sciences. And while this first book is a serious scientific investigation, it also manages to bring forensic science (specifically, forensic ecology) into the layman's arena, pursuing what Sachs calls "the postmortem stopwatch"—namely, the means by which investigators can better determine the time of death. Following various forensics experts on investigations, she conducts an intense study of the differences between rigor, livor and algor mortis; the analysis of stomach contents; the discerning tastes of flies; and bodily juices sluiced into soil. The book is sure to please readers interested in the processes of death and decomposition: this is the world of maggot instars and the generational cycles of "Great Sarcophagi." Appearing on the tail of Michael Baden's *Dead Reckoning* (Forecasts, July 23), the book brings to the fore some familiar characters (entomologist Wayne Lord and Bill Bass of the University of Tennessee's "Body Farm," among others), and in comparison, Sachs doesn't give enough time to the link between the forensic sciences and criminal investigative tactics. While the second half of the book examines practical applications of such methods, readers might not get the sense of what all this forensics hullabaloo amounts to in a court of law—or anywhere else outside of the laboratory.

# 4) The effect of body size on the rate of decomposition in a temperate region of South Africa

**AUTHORS** :**A Sutherland, J Myburgh, M Steyn**

Forensic anthropologists rely on the state of decomposition of a body to estimate the post-mortem-interval (PMI) which provides information about the natural events and environmental forces that could have affected the remains after death. Various factors are known to influence the rate of decomposition, among them temperature, rainfall and exposure of the body. However, conflicting reports appear in the literature on the effect of body size on the rate of decay. The aim of this project was to compare decomposition rates of large pigs (Sus scrofa; 60-90 kg), with that of small pigs (<35 kg), to assess the influence of body size on decomposition rates. For the decomposition rates of small pigs, 15 piglets were assessed three times per week over a period of three months during spring and early summer. Data collection was conducted until complete skeletonization occurred. Stages of decomposition were scored according to separate categories for each anatomical region, and the point values for each region were added to determine the total body score (TBS), which represents the overall stage of decomposition for each pig. For the large pigs, data of 15 pigs were used. Scatter plots illustrating the relationships between TBS and PMI as well as TBS and accumulated degree days (ADD) were used to assess the pattern of decomposition and to compare decomposition rates between small and large pigs. Results indicated that rapid decomposition occurs during the early stages of decomposition for both samples. Large pigs showed a plateau phase in the course of advanced stages of decomposition, during which decomposition was minimal. A similar, but much shorter plateau was reached by small pigs of >20 kg at a PMI of 20-25 days, after which decomposition commenced swiftly. This was in contrast to the small pigs of <20 kg, which showed no plateau phase and their decomposition rates were swift throughout the duration of the study. Overall, small pigs decomposed 2.82 times faster than large pigs, indicating that body size does have an effect on the rate of decomposition..

**5)** **Using accumulated degree-days to estimate the postmortem interval from decomposed human remains**

**AUTHORS**: Mary S Megyesi 1, Stephen P Nawrocki, Neal H Haskell

Forensic anthropologists often rely on the state of decomposition to estimate the postmortem interval (PMI) in a human remains case. The state of decomposition can provide much information about the PMI, especially when decomposition is treated as a semi-continuous variable and used in conjunction with accumulated-degree-days (ADD). This preliminary study demonstrates a supplemental method of determining the PMI based on scoring decomposition using a point-based system and taking into account temperatures in which the remains were exposed. This project was designed to examine the ways that forensic anthropologists could improve their PMI estimates based on decomposition by using a more quantitative approach. A total of 68 human remains cases with a known date of death were scored for decomposition and a regression equation was calculated to predict ADD from decomposition score. ADD accounts for approximately 80% of the variation in decomposition. This study indicates that decomposition is best modeled as dependent on accumulated temperature, not just time.